Pretest Module 8 Unit 1

1. What does the conductivity of a material depend on? Number of electrons in outer shell

2. What is required for a material to be an insulator? More than 5 valence electrons in outer shell

3. Why is silicon preferred over germanium as a semiconductor? Ability to withstand higher temperatures

4. What is the term used to describe the sharing of valance electrons by a semiconductor? Covalent bonding

5. Is a semiconductor a good conductor? Not on its own

6. What is doping in relation to semiconductors? Injecting an impurity into the crystal

7. How many valence electrons are in the material injected into the semiconductor to make “N-type” semiconductor? 5 (Pentavalent)

8. What does the “N” signify in “N-type” semiconductor material? Negative due to a surplus of electrons

9. What does the “P” signify in “P-type” semiconductor material? Positive due to a surplus of holes (or shortage of electrons)

10. How many valence electrons are in the material injected into the semiconductor to make “P-type” semiconductor? 3 (Trivalent)

11. What happens to the resistance of a semiconductor when the temperature decreases? (Think about it) Resistance increases

12. What material is typically used for “heat sinks”? Aluminum

Task 2

1. What is the barrier potential for a PN junction diode? (Silicone and germanium) .7V for silicone and .3 for germanium

2. What is the result of connecting a PN junction diode to an external voltage source reverse biased? Blocks current

3. What is the result of connecting a PN junction diode to an external voltage source forward biased? Current flows
4. What is the result of applying a voltage above the peak inverse voltage to a PN junction diode connected reverse bias? Diode will break down and avalanche current increases very quickly destroying the diode.

5. What is the primary use (for an electrician) of diodes? Power rectifier converting AC to DC.

6. What are the three main ratings for rectifier diodes? Forward current rating, forward voltage drop, peak inverse voltage rating (PIV).

7. Why are resistors typically installed in diode circuits? Limit current as diodes have very little resistance.

8. What is indicated by a penciled end on a diode? Cathode or negative.

9. How is the polarity of a diode determined if it is not marked? Specification manual or test with an ohmmeter.

10. What reading on an ohmmeter will indicate a reverse bias connection to a diode? Infinity or very high resistance.

11. What is indicated by a high resistance reading on an ohmmeter in both directions on a diode? Open-circuited.

12. What is indicated by a low resistance reading on an ohmmeter in both directions on a diode? Short-circuited.

13. What other terms are used to describe a “freewheeling” diode? Clamping or arc-suppressing.

Task 3

1. What is the main advantage of a zener diode over a regular diode? Designed for operation above the breakover voltage in reverse biased mode without damage.

2. What is one practical application of a zener diode? Voltage regulator.

3. What is the typical wattage range for a zener diode? 25 mW – 50 W.

4. When acting as a voltage regulator, how is a zener diode connected? Reverse-biased and in parallel with the load.

5. How does the resistance of the zener diode compare to the resistance of the load when connected for constant input variable load? Varies inversely.
6. What condition must be met for a zener diode to act as a half-wave rectifier? Peak AC value does not exceed the zener voltage rating

7. How are zener diodes connected for a spike suppressor circuit? Back to back

8. What is the purpose of a varistor? Surge suppressor

**Task 4**

1. How is energy given off in a silicone or germanium diode? Heat

2. How is energy given off in a gallium arsenide diode? Light

3. How is the color of emitted light determined for a LED? Controlling the doping process

4. What is the main advantage of LEDs over incandescent pilot lights? (other than energy savings) Long life

5. How does a photodiode operate? Light strikes the junction increasing the conductivity of the diode

6. What component is typically required for a photodiode to energize a control relay? Transistor

7. How are photodiodes connected for emitting light? Reverse biased